

flank of Mauna-Loa, had become active. On the 4th rather severe shocks of earthquake were felt at the Volcano House. At 3 P.M. that day a jet of lava was thrown up to the height of about 100 feet, and afterwards other jets, to the number of fifty, perhaps, were in operation. Subsequently jets of steam issued along the line formed by a fissure four miles in length, down the mountain side. On the 5th, an observing party finding the disturbance lessened, descended into the vast crater. On the plain which forms the floor of the crater a mamelon had been thrown up 1,400 feet in diameter and 700 feet in height. Fire and scoria spouted up in various places. Pele's hair, vitreous filaments formed in the volcano, abounded. Things returned to a quiescent state. Between 4 and 5 A.M. of the 10th an oscillation of the sea was observed at Hilo, on the east coast of the great southern island of Hawaii. At a quarter before 5 the great "earthquake wave" struck the village. The greatest difference between the crest and the trough of the wave was here, and it measured 36 feet. On the opposite side of the island, in Kealakekua Bay, where Cook died, the measurement was 30 feet. In other localities the difference varied down to 3 feet. The regurgitations of the sea were violent and complex, and continued through the day. The great wave seems to have struck all the islands at the same time without reference to position. The height of the waves was nowhere so great as at Hilo. In 1868 a great earthquake wave destroyed Arequipa and Arica; 30,000 lives were lost at that time. Allowing five hours for the difference of longitude between those ill-fated towns and Honolulu, and supposing that the centre of the seismic action was rightly placed, the wave on that occasion, 1868, was calculated to have travelled the 5,000 miles between Arica and Honolulu in twelve hours, or at the rate of 446 miles an hour.

THE shock of an earthquake visited the district between Aix-la-Chapelle and Cologne at about 9 A.M. on Sunday. The movement was from south-west to north-east, and lasted from three to fifteen seconds. The vibration resembled that caused by a heavy goods train. The *Cologne Gazette* remarks that the last earthquake in the Rhine district occurred on November 17, 1868, two days after a considerable eruption from Vesuvius had commenced.

AT a recent meeting of the Christchurch (N.Z.) Philosophical Institution, Dr. Haast gave an account of the discovery of remarkable ancient rock paintings in the Weka Pass Ranges. Some of them are fifteen feet long; they represent animals of foreign countries, weapons and dresses of semi-civilised people; underneath are characters like those of the Tamil language, and those on the ancient hill found in the North Island.

THE great Moscow Polytechnic Museum was opened on June 12 by an extraordinary meeting of the Society of Friends of Natural Science.

THE Irkutsk newspaper *Siberia* announces that on April 28, at 9.30 A.M., an earthquake was felt at Irkutsk. The shock was very short and rather strong.

THE second fascicule of the sixth volume of the *Memoirs* of the Kazan Society of Naturalists contains the annual report of the Society. The most important work done by the Society was a geological exploration of the permian and carboniferous deposits along the banks of the Volga, between Stavropol and Syzran, by M. Stuckenbergh, and of the banks of the Kama in the Vyatka government, by M. Zaytseff.

THE additions to the Zoological Society's Gardens during the past week include a Patas Monkey (*Cercopithecus ruber*) from West Africa, presented by Mr. Edward Poulson; a Yellow Baboon (*Cynocephalus babouin*) from West Africa, presented by Mr. H. E. Walters; a Purple Kaleege (*Euplocamus horsfieldi*)

from the North-west Himalayas, presented by Mr. John Ditmas; an Imperial Eagle (*Aquila imperialis*), European, a Barrabands Parrakeet (*Polytelis barrabandi*) from New South Wales, deposited; seven Spotted-billed Ducks (*Anas pacilorhyncha*), seven Chilian Pintails (*Dafila spinicauda*), eight Summer Ducks (*Aix sponsa*), two Bronze-winged Pigeons (*Phaps chalcoptera*), a Geoffroy's Dove (*Peristera geoffroyi*), bred in the Gardens; a Hippopotamus (*Hippopotamus amphibius*), born in Holland, purchased.

## SOCIETIES AND ACADEMIES

### LONDON

Royal Society, May 31.—"The Physical Properties of Homologues and Isomers," by Frederick D. Brown, B.Sc.

When we attempt to compare the physical properties of a series of compounds presenting very similar chemical properties, we find, that although our knowledge regarding one or two members of the series is tolerably complete, it is very restricted concerning the others.

Among the alcohols of the  $C_nH_{2n+1}OH$  series, for example, there are two—methyl and ethyl alcohols—with whose physical properties we are well acquainted, but when we pass to the other members of this series we find, that with the exception of numerous determinations of density and boiling-point, experiments have been limited to the measurements of expansion which have been carried out by Kopp, Pierre and Puchot, and others.

In order to supply this want, I have undertaken a series of experiments, the first of which are here noticed.

The density, expansion, and vapour-tension of propyl and isopropyl iodides have been measured with the greatest care; the chief difficulty to be overcome being the impurity of the liquids themselves, more than a kilogramme of each was specially prepared and dried by means of phosphoric anhydride; it was then submitted to fractional distillation, about 500 grammes of perfectly pure iodide being thus obtained; this was again distilled and collected in about four portions, each of which formed the subject of a series of experiments. The results obtained with all these portions agreed most satisfactorily, showing that when the substance is prepared with care, the error due to impurity is well nigh obviated.

The following table gives the results in such a form as to show that when the tensions of the saturated vapours of both iodides are equal, the densities and consequently the molecular volumes are unequal.

Vapour-tension in mm. Hg.	Boiling-point of normal propyl iodide.	Boiling-point of isopropyl iodide.	Density of normal propyl iodide.	Density of isopropyl iodide.	Difference between densities.
200	62°37	50°50	1·66704	1·64590	0·02114
300	73°51	61°33	1·64493	1·62359	0·02134
400	81°95	69°70	1·62808	1·60646	0·02162
500	88°84	76°44	1·61446	1·59246	0·02200
600	94°70	82°11	1·60250	1·58068	0·02182
700	99°83	87°13	1·59221	1·57035	0·02186
760	102°63	89°86	1·58670	1·56497	0·02196

It will be seen that this is in contradiction to Kopp's law, but that it is in accordance with the modern dynamical hypotheses on the constitution of matter, since the instability of the secondary iodide may be due to the greater *vis viva* of its molecules, which in turn would cause an increase of the mean distance between the molecules.

I may here mention that I have made a very complete series of experiments on the vapour-tension of normal propyl alcohol. The curve representing these observations intersects that which expresses the tensions of normal propyl iodide, so that whereas at 760 millims. the iodide boils at 102°5 and the alcohol at 97°3, at 370 millims. they boil at the same temperature, viz., 79°5, and at 120 millims. the boiling-point of the iodide is only 49°5, whilst that of the alcohol is 56°.

This fact, which probably arises from the much greater latent heat of propyl alcohol, obviously renders useless all attempts to derive the boiling-points from the constitution of chemical com-

pounds, so long as the boiling-points at the ordinary pressure of the atmosphere alone are taken into account.

**Mathematical Society, June 14.**—Lord Rayleigh, F.R.S., president, in the chair.—Prof. Crofton, F.R.S., proved some geometrical theorems relating to mean values. These theorems were chiefly interesting as examples of the employment of the theory of probability to establish mathematical results; they were of a kindred nature with theorems given in the *Phil. Trans.*, 1868, p. 185, and in Williamson's "Integral Calculus," second edition, p. 329. Mr. Merrifield made a few remarks on the communication.—Prof. Clifford, F.R.S., read a paper on the canonical form and dissection of a Riemann's surface. The object of the paper is to assist students of the theory of complex functions by proving the chief propositions about Riemann's surfaces in a concise and elementary manner. To this end certain results of Puiseux's were assumed at the outset. Prof. Smith in making remarks on the paper expressed his indebtedness to the author in having cleared up a difficulty which presents itself in Lüroth's paper on the subject.—Prof. H. J. S. Smith, F.R.S., gave a short account of a further communication upon Eisenstein's theorem.—Mr. Tucker communicated a paper by Mr. J. C. Malet entitled, "Proof that every Algebraic Equation has a Root."—The Society's next meeting will be held on the second Thursday in November.

**Royal Astronomical Society, June 8.**—Dr. Huggins, F.R.S., in the chair.—Some tables for facilitating the computation of star constants were presented by Mr. Stone.—Mr. Marth explained diagrams referring to conjunctions of Saturn and Mars between July and November next—being a triple conjunction.—Dr. Royston Pigott described a method of collimating reversible instruments by which the error could easily be determined within 2". Mr. Dunkin intimated that he would be greatly disappointed to find his collimation 0".25 out.—Mr. Gill recounted some of the troubles that beset people who go after parallax, and described some methods of getting rid of systematic errors.—The president in the name of the meeting said "Good-bye" to Mr. Gill on the eve of his departure for the Island of Ascension.—At 9 p.m. the proceedings were stopped by the president to leave time for the special meeting called to consider a proposed alteration in the bye-laws.

#### PARIS

**Academy of Sciences, June 18.**—M. Peligot in the chair.—The following papers were read:—On the notation of Berzelius, by M. Berthelot.—Some observations on the mechanism of chemical reactions, by M. Berthelot. The new facts observed relate to direct oxidation of haloid salts, and of sulphurous and arsenious acids.—On the order of appearance of the first vessels in the aerial organs of some Primula, by M. Trécul.—On the crystalline form and the optical properties of proto-iodide of mercury, by M. Des Cloizeaux. The crystals generally occur in the form of thin, flexible, weakly dichroic plates, of the quadratic system, but liable to be mistaken for a clinorhombic combination. Across the planes of cleavage they give strong double refraction, with positive axis. The salt is completely isomorphous with calomel (or the protochloride); and it is imperfectly so with red bi-iodide of mercury, which, however, has a *negative* axis. M. Berthelot, in view of such facts, remarked on the uncertainty they throw on the employment of isomorphism as a method for determining the number of atoms contained in a compound, and consequently the absolute value of the atomic weights.—Reply to the observations of M. Mouchez, by M. Villarceau.—On M. Villarceau's *Nouveau Navigation*, by M. Mouchez.—On the interior sea of the Algerian Sahara, by M. Favé. The slope at the borders of the lake, he points out, would be very pronounced.—Theory for finding the number of variants and contravariants of given order and degree linearly independent of any system of simultaneous forms containing any number of variables (continued), by Mr. Sylvester.—On the present state of the solar atmosphere; letter from P. Secchi. In presenting a *résumé* of the spots and protuberances of 1876, he gives his reasons for thinking the sun in a state of *relative* (not *absolute*) calm. M. Janssen's view that there is rather a tendency to speedy dissolution of spots than a state of (even relative) calm, implies, he thinks, the false idea that spots can be maintained for long without the continuance of eruption. Their short duration indicates a short time of eruption, therefore weak solar activity. Spots continue because the dissolved matter is replaced by freshly erupted matter. We have no proof, either, that dissolution is more rapid at the periods of

minimum. There are now signs of re-awakening activity.—On electro-magnets with rundles of iron, by M. Du Moncel. He is led to study these again by experiments of M. Fridblatt and M. Jablochkoff. The lateral action of the magnetising currents on the rundles is limited, he thinks, to a simple dynamical reaction between parallel currents, which may, with very strong currents, make plates of iron adhere strongly to the cheeks of the spiral, but which does not develop *exteriorly* on these plates well-marked magnetic polarities. This latter only occurs where the plates are so small that the spirals act on them by enveloping them like a core.—On the use of sulpho-carbonates and sulphide of carbon in treatment of the vine, by M. Marès.—On a temporary affection of sight, by M. Pierre. Reading, one day, after having had brain fever, a glazed volume, he found the characters apparently more distant than the paper (about 4 mm.); and the exercise was very fatiguing. In the next eight or ten days the characters seemed gradually to come nearer to the surface.—Historical remarks on the theory of motion of one or several constant or variable forms in an incompressible fluid, &c. (continued), by M. Bjerknes.—Determination of groups formed of a finite number of linear substitutions, by M. Jordan.—On the metallic solar eruptions observed at Palermo from 1871 till April, 1877, by M. Tacchini. In 1871 the zone of eruptions was confined between + 70° and - 40°; in 1876 it extended only between zero and - 21°; and in the first four months of 1877 there has only been one very small eruption.—On a new general method of synthesis of hydrocarbons, acetones, &c., by MM. Friedel and Crafts.—Reducing action of phosphorus on sulphate of copper; phosphides of copper, by M. Sirot.—Chemical researches on crystallised carbonate of lead formed on objects found at Pompeii, by M. de Luca.—Observations on some xanthates; separation of cobalt and nickel, by M. Phipson.—Researches on tetrachloride of carbon and its employment as an anæsthetic, by M. Morel. He was led to this application of it by the similarity of its formula (C<sub>2</sub>Cl<sub>4</sub>) to that of chloroform (C<sub>2</sub>HCl<sub>3</sub>). It is found a perfect anæsthetic and more powerful than chloroform, but quite capable of being regulated. The periods of insensibility and collapse are identical with those of chloroform; that of excitation is more pronounced. A mode of preparing the substance is described.—Observation of a bolide at Clermont-Ferrand on June 14, 1877, by M. Grérey. The head was about five to six minutes apparent diameter; the light was bright and flashing, with slight reddish and bluish gleams. No sound was perceived.—On a solar halo, by M. Vinot.

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